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Pre-Meal To-Go Boxes: Implications for Portion Control

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Abstract

Title: Pre-Meal To-Go Boxes: Implications for Portion Control

Authors: M. J. Schuster, BS; T. L. Brooks, PhD, RD; J. E. Painter, PhD, RD; C. Honselman, PhD, RD

Introduction: Obesity rates are increasing and seem to be correlated with increasing portion sizes of restaurant meals because of consumer desire for value. The purpose of this study was to determine if using a pre-meal to-go box has an impact on customers' total food intake of a restaurant meal.

Methods: Subjects were a convenience sample of adults (n=49) at a spaghetti dinner. Subjects were randomly assigned to receive approximately 18 ounces of spaghetti and sauce on their plate with a to-go box offered after the meal, or receive approximately 9 ounces of spaghetti and sauce both on their plate and in a to-go box before the meal. Meals were served on numbered plates and to-go boxes. The weights of the plates and to-go boxes were recorded before and after the meal. Subjects completed a survey measuring satisfaction with portion size, satiety, and meal quality following the meal. The university's IRB approved the study.

Results: Subjects who received pre-meal to-go boxes consumed significantly less ($p = 0.01$) than those who received a to-go box after the meal. There were no significant differences in self-reported satiety ratings, satisfaction levels, or perceived overall quality among participants who consumed less.

Conclusions: A greater amount of food initially served on the plate resulted in a greater food intake. This study supports research that suggests that consuming smaller portion sizes does not affect satisfaction, satiety, or perceived quality of the meal. Dietitians can recommend that consumers request to-go boxes and portion part of the food out at the beginning of a restaurant meal to encourage lower intake in a single sitting.

Dedication Page

Soli Deo gloria

To Annalies, Kristen, Brittany, Christoph, and Ben

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Chapter One

Introduction

Statement of the Problem

With the growing obesity epidemic, restaurants, particularly quick-service restaurants, have been encouraged to alter their menus in an effort to reduce obesity. As Americans consume an increasing number of calories outside of the home (18% in 1978 to 32% in 2008), restaurants have an increasing influence on the public's eating pattern (Lin, 2013). Unfortunately, portion sizes of menu dishes have increased significantly since the establishment of quick-service restaurants (Young and Nestle, 2002). A solution to this dilemma may present itself in the form of take-out containers.

Purpose of Study

The purpose of this study was to determine food consumption patterns in a restaurant setting by offering to-go boxes either at the beginning of the meal or at the end of the meal. The results reveal the influence of to-go containers on total food consumed.

Research Questions:

This study was designed to answer the following research questions:

1. Will there be a significant difference in the amount of food consumed if half of the meal is portioned into a to-go box before the meal?
2. Will there be a significant difference in the satisfaction ratings with the total amount of food served on the plate if part of the meal is portioned into a to-go container before the meal?
3. Will there be a significant difference in the self-reported satiety if part of the meal is portioned into a to-go container before the meal?
4. Will there be a significant difference in the satisfaction with the overall quality of the meal if part of the meal is portioned into a to-go container before the meal?

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Research Hypotheses:

i. There will be no difference in the amount of food consumed if half of the meal is portioned into a to-go box before the meal.

ii. There will be no difference in satisfaction ratings with the total amount of food served on the plate if part of the meal is portioned into a to-go box before the meal.

iii. There will be no difference in the self-reported satiety levels if part of the meal is portioned into a to-go box before the meal.

iv. There will be no difference in the satisfaction with the overall quality of the meal if part of the meal is portioned into a to-go box before the meal.

Definition of Terms

Below are the terms that were defined for better understanding of the research:

i. *BMI* – Body mass index is defined as weight in kilograms divided by height in meters squared (Centers for Disease Control, 2013).

ii. *Casual-midscale restaurant* –a sit-down restaurant that is usually less expensive than a formal restaurant, and yet more expensive than a family or quick-service restaurant. Targets individuals, families and professionals as the primary customer base (Ninemeier & Perdue, 2004).

iii. *Obesity* – defines a weight per height ratio that is considered higher than healthy and increases risk of disease and health problems (Centers for Disease Control and Prevention, 2012).

iv. *Obesogenic* – promoting excess weight gain (Merriam-Webster Dictionary, n.d.).

v. *Quick-service restaurant* –a restaurant that has a consistent menu with fast, efficient service of food to customers with minimal to no table waiting. Quick-service restaurants

can be synonymous for fast-food restaurants and are often part of a chain (Parpal, M., n.d.).

vi. *Satiety* –a physical feeling of fullness to or beyond capacity following food consumption (Merriam-Webster Dictionary, n.d.)

Chapter Two

Review of Literature

Maintaining a healthy weight is essential to a healthy life. The United States Department of Agriculture provides food portion size recommendations to promote ideal eating habits (USDA, n.d.). Americans' diets are largely influenced by restaurants and the fast-food industry. The topics covered in this chapter include: obesity in the United States, obesity interventions, growth of the restaurant industry, environmental factors affecting diet, and consumer perceptions of food. Research suggests that increasing portion sizes of foods in quick service restaurants have contributed to the obesity epidemic; therefore, solutions and interventions are urgently needed (Nielsen, & Popkin, 2003).

The Obesity Epidemic

Obesity has been increasing in the United States. Specifically, obesity rates among adults have risen from 12% in 1990 (Menifield, Doty, & Fletcher, 2008) to 35.9% in 2010 (Centers for Disease Control, 2013). Obese adults have a body mass index of 30 or greater (Centers for Disease Control, 2013). With the increasing incidence of obesity, leading to more chronic disease and health care costs, some public health officials have labeled the trend an epidemic (Levitsky, & Youn, 2004). Although overall obesity rates are projected to level off slightly, nonetheless, a predicted 42% of adults will be obese by 2030 (Finkelstein, Khavjou, Thompson, Trogdon, Pan, Sherry, & Dietz, 2012). The rate of individuals who are 80+ pounds overweight (severe obesity) is expected to increase by 130% over the next two decades (Finkelstein, et al., 2012). The healthcare costs of rising of obesity rates from 2012 -2030, are estimated at $549.5 billion (Finkelstein, et al., 2012).

Causes of Obesity

The fundamental cause of obesity in the United States is the obesogenic environment created by increasing energy intake and decreased physical activity (Levitsky & Youn, 2004), while the influencing factors of these causes are more numerous and complex. As in many

modernized countries, the increased availability of energy-dense foods high in saturated fat and refined carbohydrates, along with a lower need for physical labor, Americans have the opportunity to consume more calories than they expend (University of Rochester Medical Center, n.d.). However, obesity is not strictly a result of the environment. Studies on identical twins indicate that genetics also influence obesity risk although, genetics are not the final determinant; a prospective study on 20,000 adults found that regular exercise lowered obesity risk by 40% among those genetically predisposed to it (Naukkarinen, Rissanen, Kaprio, & Pietiläinen, 2012; Kaprio, & Koskenvuo, 2002; Rose, Dick, Viken, & Kaprio, 2001).

Interventions

Until recently, obesity interventions have focused on disease treatment, often with unsuccessful long-term outcomes. With the poor outlook for obesity, drastic measures, such as bariatric surgeries are becoming common, although even these have limited results because of strong lifestyle habits (Callahan, 2013). Today, more healthcare professionals are shifting to obesity prevention, focusing on both dietary changes and increased physical activity (Lemmens, Oenema, Kleep, Hendriksen, & Brug, 2008). A review of nine obesity interventions that utilized diet and exercise concluded that at the end of participant follow-up, only three of the interventions produced positive long-term lifestyle changes (Lemmens, et al., 2008). The authors concluded that more research needs to be conducted to determine specific, effective methods of intervention. Besides lifestyle interventions, other common interventions include: weight-loss diets, nutrition education, nutrition-information labeling in restaurants, fitness apps for smartphones, etc.

In an attempt to promote better consumer choices, the 2010 Health Care Reform Law required all chain restaurants to post calorie content of their products (Health reform to deliver calorie, 2010). Unfortunately, this information is often not clearly displayed or the font is very small, decreasing the visibility of the information and the likelihood of consumers incorporating that information in their decision and limiting the effectiveness of this initiative (Bassett,

Dumanovsky, Huang, Silver, Young, Nonas, Matte, Chideya, & Frieden, 2008; Roberto, Agnew, & Brownell, 2009).

Due to weak success of many government and personal weight-loss interventions, it has been suggested that the only effective way to solve this epidemic is through stigmatizing obesity and the behaviors associated with weight gain, such as the smoking campaign that decreased smoking rates to currently 20% of the population (Callahan, 2013). Callahan (2013) claims that this may be the reality check that many Americans need. Public surveys reveal that the same percentage of adults today and adults over the past 20 years, think of themselves as being overweight; essentially it has now become normal to be fat (Callahan, 2013).

Since quick-service restaurants were established in the 1940s, portion sizes of commercially prepared foods served have been gradually increasing, but in the past two decades portion sizes have dramatically increased (Young & Nestle, 2007). One method restaurants entice customers with is to offer cheaper prices for larger portions, promoting sales, thereby increasing their profit, and unfortunately, also their customer's intake (Edwards, Engstrom, & Gustafsson, 2008). When larger portion sizes are offered, customers almost always will consume more food (Rolls, Roe, Kral, Meengs, & Wall, 2004; Rolls, Roe, & Meengs, 2006). However, research by Vermeer, Steenhuis, & Seidell (2009) shows that food service industry representatives reported consumer education as the only effective obesity intervention. Additionally, these representatives believed that their restaurants did not need to alter their customer's portions sizes, even though research has determined that education alone is insufficient (Vermeer, Steenhuis, & Seidel, 2009).

In addition to increasing portion sizes in restaurants, Americans are consuming more food outside the home than any previous generation. The National Restaurant Association reported that in 2012, Americans spent almost 50% of their food dollar in restaurants and in 2011 the average household spent $2,620 on food outside the home (National Restaurant Association, 2013). As Americans are spending more and more of their food dollars outside of the home, the

need to intervene in restaurants to quell obesity is apparent. Increased overall food consumption in restaurants stems from two multifaceted factors: environmental cues and consumer perceptions, creating norms that dictate acceptable eating behaviors.

Environmental Cues

Environmental cues include factors such as the environment of food package sizes, the sizes of serving containers, proximity of food, the presence of larger portions, irregularities in portion size labeling, visual cues, consumption patterns, and finally the influence of peer pressure when eating out. The current environment surrounding packaged food is one of progressively increasing package size and serving size, which in turn increases consumer consumption during each eating episode (Young & Nestle, 2002), because the larger the portion an individual is served, the more they tend to consume (Levitsky & Youn, 2004; Steenhuis & Vermeer, 2009). Since customers are receiving larger portions, they have easier access to a larger than necessary amount of food, which increases the amount of food they consume. In situations outside of a typical restaurant, social determinants such as who serves the food, the manner of serving (automatic, self-serve, or on request), the quality of food, and the availability of second servings all moderate intake of the customers (Gittelsohn, 1991). In most restaurant settings, aside from a buffet, customers' portion size is determined by the restaurant, and is only made available through the wait staff. While this may be beneficial if the portion size is close to the appropriate servings, it can be detrimental if the portion size is larger than recommended, because it creates the opportunity to continue to eat beyond satiety cues.

Research has found that food consumption depends on consumer awareness of portion sizes and the energy density of foods. Research on these two factors concludes that both energy density and portion size independently influence energy intake during meals, with both factors leading to a sustained, yet unintentional energy intake increase (Rolls, et al, 2006). Larger portion sizes increase intake while smaller portion sizes decrease intake. One study that served participants 50% larger portion sizes found that participants sustained an average additional

intake of 432 calories without a significant decrease over a period of 11 days (Rolls, Roe, & Meengs, 2007). This relationship holds true to decreasing portion sizes as well. In a controlled research study, decreasing the portion size by 25% resulted in a 10±2.1% decrease in weight of food consumed, which was approximately 230 calories at each meal. In this same study, researchers found that increasing the energy density of food did not significantly decrease the weight of food participants consumed (Rolls, Roes, Meengs, 2006). Both reducing and increasing the energy density of foods creates hidden changes in calorie intake.

Research on other strategies to promote satiety during meals, while decreasing overall intake, has been conducted. One study found that consuming a salad prior to the meal decreased participant consumption of the entrée by an average of 123±18 calories (William, Roe, & Rolls, 2014). Using the same intervention, a study found that serving children large portions of vegetable soup at the beginning of their meal significantly reduced their intake of the entrée, and increased their vegetable consumption at the meal without changing vegetable consumption throughout the rest of the day (Spill, Birch, Roe, & Rolls, 2011).

The size and shape of eating containers, such as plates and bowls, also influence consumption through visual cues. Research shows that people pour more in wide short glasses than tall skinny glasses and consume more food from a wide container than from a tall container and the amount consumed is proportional to the amount served them (Wansink & Van Ittersum, 2003, 2005; Lawless, Bender, Oman, & Pelletier, 2003; Levitsky & Youn, 2004). All of this appears to be contributing to the obesity epidemic as observational studies show that the sizes of containers are increasing in the United States (Nielsen & Popkin, 2003).

Another environmental cue that shows much potential for modification is plate and bowl size. Differences in sizes of both the serving or immediate consumption container, distort individuals' perceived consumption; larger serving containers drastically increase intake without the knowledge of the customer (Wansink & Cheny, 2005; Wansink, 2006). Research on plate size

itself shows mixed results with four studies suggesting that it does influence intake by altering consumers' portion size estimations, and three studies suggest that it does not directly influence intake (Rolls, Roe, Halverson, & Meengs, 2007). When plate size was the only variable in a controlled environment, three studies each with slight variations found that participants did not consume a significantly different amount of food despite using thee different plate sizes, in which the largest plate was almost twice the size of the smallest plate used. In the first study the participants served themselves, in the second their portion was given to them, and in the third they served themselves from a buffet.

Other research suggest that inside and outside the home and both with self-serve and pre-portioned portion sizes, larger plates have the potential to hold larger portion sizes, which increases the amount of room on the plate for food and the food directly available in front of the consumer during a meal, and research overwhelming concludes that the presence of more food increases intake (Rolls, Roe, Halverson, & Meengs, 2007). These findings show that it would be beneficial to use smaller plate sizes to reduce intake during meals (Rolls, Roe, Halverson, & Meengs, 2007).

Bowl size has also been studied and these studies suggest that bowl size does affect intake (Wansink, Painter, & North, J. (2005). One experimental study found that when offered snacks in different size serving bowls (2 or 4 quarts) individuals served themselves 53% more and consumed 59% from the larger bowls than those served from the medium size bowls. Surveys after the snack showed that 87% of individuals who ate from the larger serving bowl did not perceive that they had served or consumed any more than those served from the medium size bowl (Wansink & Cheny, 2005; Wansink, 2006; Wansink & Sobal, 2007).

The same is true with immediate consumption containers, with a large plate or bowl increasing consumption compared to a small plate or bowl. An experimental study with self-serve ice cream found that individuals served themselves 31% more using a 34oz bowl compared to those who were given a 17oz bowl, but were not aware of their actions (Wansink, Van Ittersum,

& Painter, 2006). When customers purchase prepackaged food, larger package sizes may increase their intake because of a researched predisposition to consume most of the food on their plate, which may be due in part to their upbringing. Perhaps an explanation for this behavior is that despite different bowl sizes (12-, 16-, and 24-oz bowls), participants appeared to fill approximately the same percentage of the bowl (77, 74, and 64% respectively) (Wansink & Van Ittersum, 2006). This behavior is detrimental to food consumption patterns because of trends of increasing portion sizes in the United States.

Minimal research is available regarding food utensils, however, one study found "that even nutrition experts who were given 3-oz capacity serving spoons at an ice cream social served themselves 14.5% more than those who had been given 2-oz serving spoons (Wansink, Van Ittersum, & Painter, 2006).

The availability of food, or the distance to the food determines how much an individual will eat; when food is closer individuals consume it more frequently and in greater quantities (Engell, Kramer, Malafi, Salomon, & Lesh, 1996). One study found that moving a bowl of candy six feet out of reach in the same room decreased intake by half (Wansink, Painter, & Lee, 2006). When food is out of immediate reach, research has determined that the most influential force on an individual's decision to move to get food is not the extra effort of standing up from a sitting position to get the food, but the conscious decision the distance creates on whether it is appropriate to get more food (Wansink, Painter, & Lee, 2006). In addition, eating in rooms that contain large amounts of stored foods also increase intake, because of the visibility and convenience of the food. In these studies, convenience foods are consumed more frequently, while non-convenience foods are consumed less frequently, but in greater amounts than convenience foods (Chandon & Wansink, 2002).

In the presence of larger portion sizes, people consume more food, regardless of flavor or quality of the food (Wansink & Kim, 2005). Despite government efforts to regulate labeling and provide consumers with information on appropriate serving amounts, the recommendations are

vague (eat "sensible portions") and although these recommendations are supposedly based on average reported intakes, they appear smaller than these (Young & Nestle, 2002). The portion size information that is provided does not appear to effectively alter consumer intake (Harnack, French, Oakes, Story, Jeffery, & Rydell, 2008; Ueland, Cardello, Merril & Lesher, 2009). Additionally, direct reduction of portion sizes does not provide definitive results. While a study that reduced portion sizes by 25% in a laboratory found significant results, a similar study in a college cafeteria found no significant difference in food intake (Lieux, & Manning, 1992; Rolls, Roe, & Meengs, 2006b).

Irregularities within portion sizes of food categories also lead to unintended extra intake. A study found that the lack of standardization between fast-food companies' and quick service restaurant labeling of drinks and foods as small, medium or large makes it even more challenging for consumers to determine appropriate serving sizes (Nielsen & Popkin, 2003). An example of this is consuming a small burger with a known number of calories may not be similar to a burger titled "small" at another restaurant. Additionally, over the past 20 years, several of the largest fast-food companies have changed the size labeling of their products from medium or large to names such as Supersize, Biggie, and Great Biggie. (Young & Nestle, 2002).

Visual cues increase consumer intake in a restaurant setting, but also through the expectations of food serving sizes consumed in the home. Portion distortion is the term for the growing trend of consumer acceptance of restaurant size servings as the daily appropriate serving size, which leads consumers to expect similarly large portion sizes even when eating at home (Matthiessen, Fagt, Biltoft-Jensen, Beck, & Ovesen, 2003). As restaurant portion sizes are increasing, customers are expecting and consuming larger portions, even when at home. Some research has also concluded that larger bowl sizes increases customer intake during a meal, although the same effect is undetermined regarding plates and silverware size (Wansink, Painter, & North, 2005). Consumers base their satiety off of what they see themselves eating rather than listening to internal satiety cues. A study by Wansink, Painter, & North (2005) found that when

unknowingly served soup in self-refilling bowls, customers ate 73% more than customers who ate out of regular bowls, and yet both reported on average the same level of satiety and perceived intake (Wansink, et al., 2005).

These patterns and behaviors all contribute to the obesogenic environment present in the United States. First, multiple experimental studies indicate that individuals usually consume 92% of the food they serve themselves (Wansink & Cheney, 2005) and they consume most food they are served because of the common practice to consume all of the food on ones' plate (Wansink, 2004, 2006; Geier, Rozin, & Doros, 2006). Second, food intake is proportional to the amount served (e.g., Levitsky & Youn, 2004; Rolls, Roe, & Meengs, 2006; Young & Nestle, 2002) and the size of containers that food is served on influences how much is consumed due to food availability. Third, researchers estimate that 71% of all food consumed is eaten out of "an intermediate transfer device such as a plate, glass, or spoon" and the remaining 30% is consumed directly out of food package containers (Wansink, 1996).

Finally, the social environment influences eating behaviors, although there is rather limited research in this area. Two studies conducted on secondary school children's lunch showed varied results; in one study, subjects consumed significantly more food in the presence of others in all test settings, while another study showed that subjects consumed significantly more eating alone than with others (de Castro, 1991; Woodruff, Hanning, & McGoldrick, 2010). Results from another study conducted on adults suggested that food intake is positively increased by the presence of others at the meal by increasing the amount consumed and the time spent at the meal (de Castro, 1990). The limited research available suggests that in some instances, intake is increased by the presence of others at the meal, although it is certain that the presence of others influences consumer intake.

Consumer Perceptions

In addition to the influences of the environment on consumer intake, several other factors also influence consumer food intake, such as consumer values, perception of caloric content of food, and the influence of body size on self-estimated calorie needs.

When purchasing food, American consumers will generally choose an item based on value for price rather than an appropriate portion size. Restaurants have taken advantage of this value by offering larger portions of food at a lower cost per serving, and many consumers will purchase larger portions than what they should eat in one sitting, because of its value for price, thus increasing overall consumer spending and the restaurant's profits (Steenhuis & Vermeer, 2009). Despite knowledge of appropriate serving sizes and the need to eat less when sitting in the restaurant or purchasing food elsewhere, the consumer often chooses the more cost effective product over the appropriate serving size for that meal.

One strategy employed to decrease customers' calorie consumption is to order foods that have low energy density before or during the meal (Flood & Rolls, 2007; Williams & Rolls, 2014). One Chinese restaurant has tried to encourage self-control in customer choices by servers offering a smaller size of three starchy side dishes (Schwartz, Riis, Elbel, & Ariely, 2012). Results of this study found that 33% of customers accepted the offer regardless of whether they were or were not offered twenty-five-cent reduction in price. Analysis found that customers who choose to downsize consumed an average of 200 fewer calories and still left the same amount of food on their plates. This research shows that implementing portion control in restaurants may be a feasible intervention in the obesity epidemic, and when given the option approximately one-third of customers will choose smaller portions, thus decreasing their total intake at the restaurant.

Characteristics of food such as textures, shape, colors, toppings, and condiments further complicate the food environment by lessoning consumer ability to accurately judge portion size or provide definitive divisions or segments of a food object. Consumers have difficulty accurately judging portion size; although once food is served on their plate, in general most food will be

consumed because individuals habitually eat most of the food on their plate (Wansink, 2004, 2006; Geier et al., 2006). Food without a particular shape is especially difficult for consumers to judge (Slawson & Eck, 1997). Experimental studies show that consumers perceive foods in two-dimensional shapes to be larger than foods of the same volume that are three-dimensional shapes (Slawson & Eck, 1997).

Divisions or demarcations on the surface of the food itself contribute to individual's ability to judge appropriate amount to each. Foods that are pre-divided (e.g. chocolate bars) have grill marks, are sprinkled with spices or seasoning, or have decorative toppings enable consumers to more accurately judge portion size or decide on where to divide the food into appropriate portion size (Sobal & Wansink, 2007). Foods that have smooth textures and are uniform create difficulty for consumers to choose an ending point in consumption because these provide less guidance as to how much has been consumed and how much is left to consume (Sobal & Wansink, 2007). While uniform texture or appearance increases food intake, in a similar vein, some studies indicate that a large variety of color increase food intake. A study by Kahn and Wansink (2004) found that high-variety assortments of different colored foods led to greater food consumption.

Body mass index (BMI) of an individual also appears to influence intake. Research by Edwards, Engstrom, and Gustafsson, (2008) indicates that individuals with a higher BMI tend to estimate their energy needs as being higher than individuals with a lower BMI. The researchers of this study conducted a correlation study, so there was no evidence to say that increased BMI increases an individual's estimation of calorie needs. Finally, one further confounding factor is that consumers do not have an accurate perception of calorie content of food, although on average individuals' estimations are not statistically different than the actual caloric content (Edwards, Engstrom, & Gustafsson, 2008).

Conclusions

Based on these factors which further complicate the food environment for todays' consumers, it is necessary for public health educators and food service companies to intervene in the obesity epidemic. There is a need for Americans to decrease their energy intake as they are unknowingly consuming more calories than is adequate.

One suggested intervention for decreasing obesity risk through restaurant food is by decreasing the energy density of the food so that consumers achieve the same level of satiety through a lower number of calories, although studies show mixed results regarding the effectiveness of this intervention (Steeinhuis & Vermeer, 2009). It has also been suggested that increasing portion sizes of healthful foods can be used to increase intake of these foods, and in so doing lower consumption of more unhealthful foods (Haws & Winterich, 2013). Both of these suggestions would require research, and would likely have high implementation costs and low buy-in from restaurant companies.

A more feasible solution, which would be simple to implement and still allow restaurants to advertise lower prices for purchasing a larger portion, and still decrease excess food consumption, is through portioning out part of the meal in a to-go box prior to serving the customer. By putting part of the meal out of sight, the customer would still receive the satiety that comes from consuming a full meal, with the reward of taking home another meal as well. There is currently no research on the use of to-go boxes to decrease consumer intake when eating out.

Chapter Three

Methodology

This section discusses the design of the study, the pilot study, the sample, instrumentation, procedure for data collection and data analysis.

Design of Study

This study utilized observations regarding consumers in a full-service restaurant setting to determine specific behaviors. The study design was a quantitative, experimental study, measuring total food consumption, satisfaction with portion size, satiety levels, and overall satisfaction with the quality of the meal when a to-go box was offered before or after the meal. The design provided participants with a natural restaurant setting to facilitate usual consumption patterns. Data collection took place over one evening meal. The University's IRB approved the study methodology. Participants completed a consent form prior to the study (Appendix A).

Questionnaire Development

In fall 2013, a survey was developed by the researcher to determine participants' satisfaction and fullness following the meal (Appendix B). A convenience sample of adults (n=40) from a Midwestern university volunteered to complete the survey after consuming the same meal that would be used for this study. The questionnaire was further reviewed for clarity and relevance by three dietetics professors.

Sample

The sample for this study included a convenience sample of forty-nine customers at a campus restaurant at a Midwestern university. The participants were invited via email lists from previous campus restaurant dining experiences they had attended (Appendix C). The meal was advertised as a free dinner. Only data collected from participants 18 years or older was used.

Instrumentation

A researcher-developed survey was used for this study (Appendix B). The survey included demographic questions revealing the age and gender of the participants. Satisfaction with portion size, satiety levels, and overall satisfaction with the quality of the meal were determined using a seven-point Likert scale (1=strongly agree to 7=-strongly disagree). An open-ended question that allowed for additional comments was also included.

Procedure for Data Collection

The total ounces of spaghetti and spaghetti sauce served to the participants was based on an average dinner serving of spaghetti and spaghetti sauce from several popular restaurants, including Olive Garden, Romano's Macaroni Grill, Old Spaghetti Factory, etc. The researcher was accompanied by several trained assistants. The servers portioned and served equal amount of salad (approximately 2.5 ounces) and bread sticks (two breadstick per person) to each dining table. Tables were randomly selected to receive either the entire meal on the plate with a to-go box offered at the end of the meal (control group), or half of the meal brought to the table in a to-go box and half on the plate (pre-meal to –go box group). Following the meal, all participants were asked to complete the researcher-developed customer satisfaction survey.

Control Group Meal Methodology

The full meals were portioned first onto plates that were pre-numbered discretely on the bottom. The researcher and assistants measured out three cups of spaghetti and one cup of spaghetti sauce using a cup measure, totaling approximately 18 oz. An assistant weighed the plate with the spaghetti and spaghetti sauce on a tared kitchen scale and recorded the data with the plate number on a data collection sheet (Appendix D). Following the meal, the server offered participants a to-go box to take home any leftovers. The server then removed the plate to another room where the amount remaining on the plate and in the to-go box was weighed on tared scales and recorded with the corresponding plate number.

Pre-Meal To-go Box Meals Methodology

The meals served partially in to-go boxes were portioned second. The researcher and assistants used cup measures to measure out one and one half cups of spaghetti and a half cup of spaghetti sauce onto plates that were discretely numbered on the bottom. Then, the researcher and assistants measured out one and one half cups of spaghetti and a half cup of spaghetti sauce using a cup measure into the to-go box with the corresponding number on the bottom. An assistant weighed the plate with the spaghetti and spaghetti sauce on a tared kitchen scale and recorded the data with the plate number on a data collection sheet (Appendix D). Another assistant weighed the to-go box with its contents on a second tared kitchen scale and recorded the data with the box number. Following the meal, the server asked the participant if they wished to add any leftovers to their to-go container. The server then removed the plate and the to-go container to another room where the amount remaining on the plate and the amount in the to-go container was be weighed on tared scales and recorded with the corresponding plate and box number.

Data Analysis

Data were analyzed using Excel. The researcher used t-tests to determine statistical significance between the total consumption from individuals who received the to-go box before or after the meal. From the survey results, the researcher used Excel to analyze the frequencies and means of responses to examine satisfaction with meal size, satiety levels, and overall satisfaction with the quality of the meal with a to-go box being offered before or after the meal. The researcher also used t-test to determine significance from the survey results.

Chapter Four

Results

The following section presents the data regarding the influence of using pre-meal to-go boxes on consumption in a casual, midscale restaurant setting.

Demographic Data

Participants were a convenience sample of forty-nine adults recruited via an email list at a Midwestern university. Eight subjects did not fully complete a survey and were not included in the analysis. Of the participants (n=41), 41.4% (n=17) were males and 58.5% (n=24) were females. Ages of participants ranged from 18 to 89 years. A description of the sample can be viewed in Tables 1 through 2 and Figures 1 through 3.

Table 1

Ages of Participants in the Control Group (n=41)

Age	18 -24	25-34	35-49	50-64	65+
No Pre-Meal To-Go Box Group					
Male	7 (31.8%)	0 (0%)	3 (13.6%)	2 (9.1%)	2 (9.1%)
Female	1 (4.5%)	0 (0%)	2 (9.1%)	0 (0%)	5 (22.7%)
Pre-Meal To-Go Box Group					
Male	1 (5.3%)	0 (0%)	1 (5.3%)	1 (5.3%)	0 (0%)
Female	3 (15.8%)	1 (5.3%)	0 (0%)	6 (31.6%)	6 (31.6%)

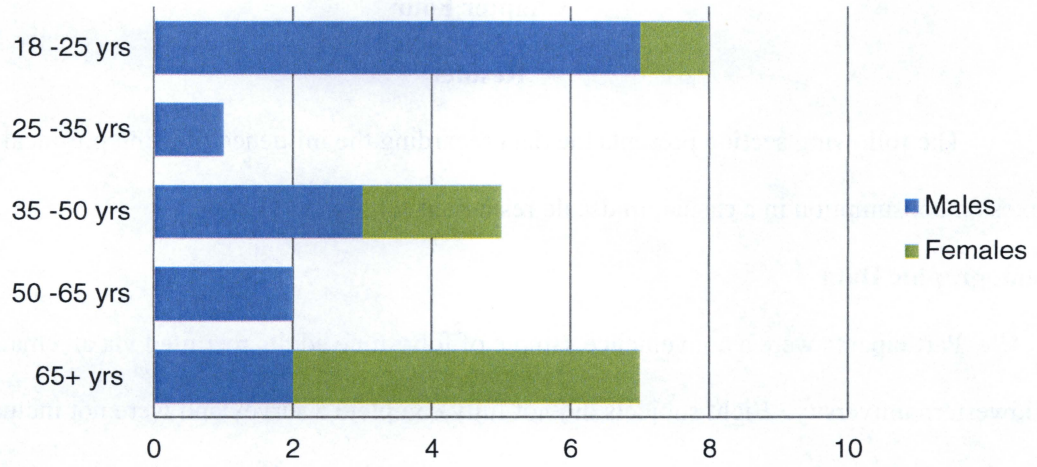

Figure 1: Ages of Participants in the Control Group (n=22)

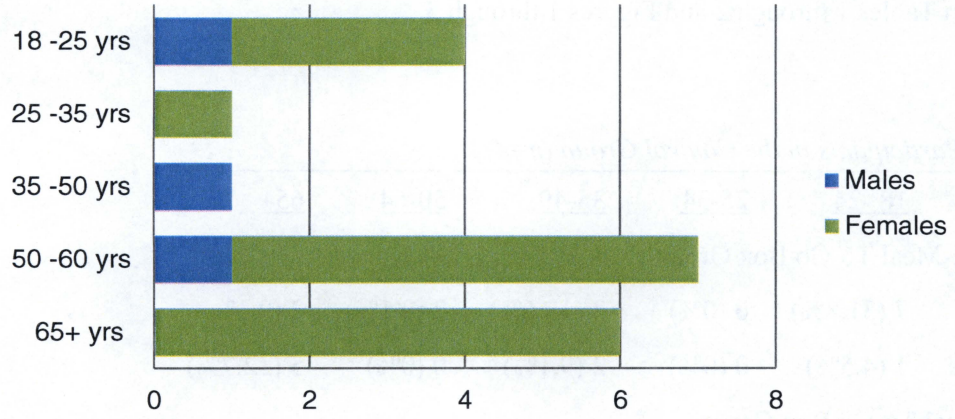

Figure 2: Ages of Participants in the Pre-Meal To-Go Box Group (n=19)

Among those participants in the control group, 63.6% (n=14) were males and 36.4% (n= 8) were females (Table 2). Among those who indicated on their survey they received a pre-meal to-go box group, 15.8% (n=3) were males and 84.2% (n=16) were females (Table 2).

Table 2

Gender of Participants (n=41)

Gender	Male	Female
Control	14 (63.6%)	8 (36.4%)
Pre-Meal To-Go Box	3 (15.8%)	16 (84.2%)

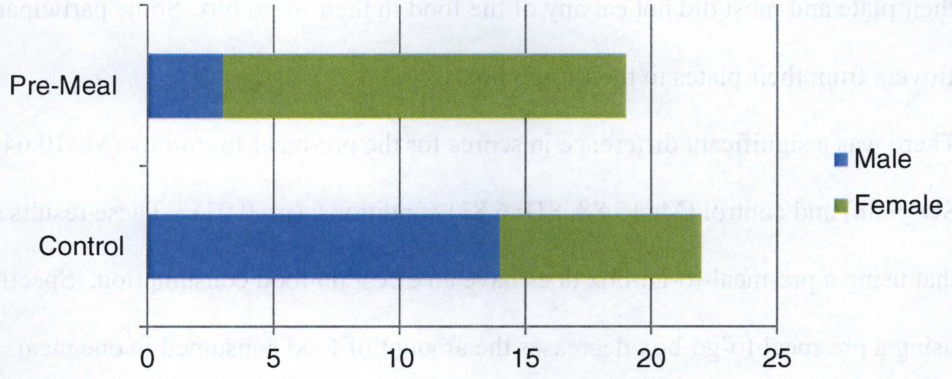

Figure 3: Gender of Participants

Spaghetti Data Results

An independent samples t-test was conducted to compare food consumption amounts using pre-meal-to-go box and control conditions. There were complete pre- and post-meal weight data collected on 36 plates, 18 from the pre-meal to-go box group and 18 from the control group.

Control Group Results

Participants in the control group received on average 19.7 ounces of spaghetti on their plate and the average weight of spaghetti remaining on their plate at the end of the meal was 3.83 ounces (p=.0001) (Table 3). On average, participants in the control group consumed a total of 15.88 ounces of food (Table 4). Only 5 participants chose to have post-meal to-go boxes for their leftovers.

Table 3

Food Consumption by Group: Weights in Ounces

	Pre-meal weight	Post-meal weight	Food consumed
Control Group	11.06	2.74	8.32
Pre-Meal Group	19.7	3.83	15.88

Note. **p<.0001, two tailed, independent unequal variance

Research question 1.

Participants who received a pre-meal to-go box consumed on average 10.64 ounces of spaghetti (Table 4). In addition, 67% took home an average of 6.26 ounces of spaghetti leftovers in the to-go box.

A large majority of participants who received a pre-meal to-go box consumed all of the food on their plate and most did not eat any of the food in their to-go box. Some participants even added leftovers from their plates to their to-go box.

i. There was a significant difference in scores for the pre-meal-to-go-box (M=10.64, SD=5.58) and control (M=15.88, SD=6.83) conditions; (p= 0.01). These results suggest that using a pre-meal-to-go-box does have an effect on food consumption. Specifically, using a pre-meal-to-go-box decreases the amount of food consumed in one meal. Results from this study found a significant difference in the amount of food consumed if half of the meal was portioned into a to-go box before the meal; therefore, the researcher rejected the null hypothesis that there will be no difference in the amount of food consumed if half of the meal is portioned into a to-go box before the meal.

Table 4

Total Combined Food Consumption: Food Weights in Ounces

	Pre-meal group (n=18)	Control group (n=18)	T-test (n=36)
Combined weight	10.64	15.88	0.01*

Note. *p<.05, two tailed, independent, unequal variance
Note. Combined weight includes plate and to-go box food weights

Customer Satisfaction Survey Results

Participants were given a Customer Satisfaction Survey following completion of the meal to measure their satisfaction with meal portion size(s), their satiety following the meal, and their perceived quality of the meal.

At the conclusion of the study, the researcher collected forty-nine surveys, but eight were incomplete, leaving only forty-one surveys eligible to include in the results.

Research question 2.

i. Question 1 of the survey measured participants' satisfaction with the portion sizes of food on the plate. The mean answer of control group participants was 2.11, while the mean answer of pre-meal to-go box group participants was 2.05, indicating that participants in the pre-meal to-go box group were only slightly less satisfied with the portion size of food on their plate compared to the control group. There was no significant difference between the pre-meal and control group's answers to question 1 ($p= 0.92$) (Table 6); therefore, the researcher accepted the null hypothesis that there will be no difference in satisfaction ratings with the total amount of food served on the plate if part of the meal is portioned into a to-go box before the meal.

Research question 3.

i. Question 2 of the survey measured participants' satiety following the meal. The mean answer of the control group participants was 1.41 and the mean answer of the pre-meal to-go box participants was 1.58, indicating that participants in the pre-meal to-go box group were only slightly less full following the meal compared to the control group. There was no significant difference ($p= 0.61$) between the two groups' measure of fullness following the meal (Table 6); therefore, the researcher accepted the null hypothesis that there will be no difference in the self-reported satiety levels if part of the meal is portioned into a to-go box before the meal.

Research question 4.

i. Question 3 of the survey measured participants' perception of the quality of the meal. The mean answer of the control group participants was 2.86 and the mean answer of the pre-meal to-go box participants was 2.79, indicating that participants in the pre-meal to-go box group were slightly more satisfied with the quality of the meal compared to the control group. There was no significant difference ($p= 0.89$) between the two groups'

ratings of the quality of the meal; therefore, the researcher accepted the null hypothesis that there will be no difference in the satisfaction with the overall quality of the meal if part of the meal is portioned into a to-go box before the meal.

Table 5

Participant Responses to Survey Question: Frequencies and Percentages (n=41)

Question	Strongly Agree		Moderately Agree		Slightly Agree		Neutral		Slightly Disagree		Moderately Disagree		Strongly Disagree		Mean
	n	%	N	%	n	%	N	%	n	%	N	%	n	%	
1*	11	61.1	4	22.2	0	0.0	0	0.0	1	5.6	0	0.0	2	11.1	2.11
1 pre	8	42.1	6	31.6	3	15.81	1	5.3	0	0.0	1	5.3	0	0.0	2.05
2	19	86.4	1	4.5	1	4.5	0	0.0	0	0.0	0	0.0	1	4.5	1.41
2 pre	13	68.4	4	21.1	1	5.3	0	0.0	0	0.0	1	5.3	0	0.0	1.58
3	4	18.2	10	45.5	3	13.6	0	0.0	2	9.1	1	4.5	2	9.1	2.86
3 pre	6	31.6	4	21.1	4	21.1	0	0.0	3	15.8	2	10.5	0	0.0	2.79

Note. Likert type scale of 1= strongly agree, 4 = neutral, 7= strongly disagree;
Note. Q1: I was satisfied with the portion size of the food on my plate.
Note. Q2: I felt full at the end of the meal.
Note. Q3: Overall, the quality of this meal was excellent.
Note. Questions followed by "pre" refer to results collected from surveys of individuals who received a pre-meal to-go box. Questions not followed by "pre" are results collected from surveys of those who were in the control group.
Note. *four participants did not answer this questions (n=18)

Table 6 provides a summary of both the experimental and control groups' mean intake of the spaghetti meal and analysis of their responses to the Customer Satisfaction Survey. The results of this study indicate that there was a significant difference in the amount of food consumed for the pre-meal-to-go-box (M=10.64, SD=5.58) and control (M=15.88, SD=6.83) conditions; (p= 0.01). These results suggest that using a pre-meal-to-go-box decreases the amount of food consumed in one meal. There was no significant difference between groups regarding portion sizes, fullness, and quality of the meal, suggesting that pre-meal to-go boxes will not affect the customer's perception of a meal.

Results from this study indicate that there was no significant difference in satisfaction with the total amount of food served on the plate if part of the meal was portioned into a to-go container before the meal. In addition, these results indicate that there was no significant difference in the self-reported satiety levels if part of the meal was portioned into a to-go

container before the meal. Finally these results indicate that there was no significant difference in the satisfaction with the overall quality of the meal if part of the meal was portioned into a to-go container before the meal.

Table 6

T-test Values for Research Questions

Measurement	Pre-Meal To-Go Box Mean	Control Mean	T-test Value*
Total Food	10.64	15.88	0.01*
Satisfaction	2.05	2.11	0.92
Satiety	1.58	1.41	0.31
Overall Quality	2.79	2.86	0.89

Note. *p= <.05, one tailed, independent, unequal variance

Chapter Five

Discussion

The overall results showed that participants who received a pre-meal to-go box were likely to consume significantly less ($p = 0.01$) spaghetti by weight compared to the control group. A smaller amount of food initially served on the plate resulted in a lesser food intake, and a greater amount of food initially served on the plate was correlated with a greater food intake. The findings of this study support research which suggests that consumers who are served larger portion sizes consume more food (Rolls, Roe, Kral, Meengs, & Wall, 2004; Rolls, Roe, & Meengs, 2006a).

Those who received pre-meal to-go boxes consumed an average of 4.65 ounces less than the control group. Participants who received a pre-meal to-go box took home a to-go box containing an average of 8.39 ounces of spaghetti, while only five out of twenty-four control group participants took home a box with leftovers. The very low number of control group participants who took home to-go boxes may be partially attributed to the servers occasionally forgetting to offer to-go boxes after the participant had finished the meal.

These results agree with research that individuals are less likely to consume food, or consume smaller amounts of food, that is out of sight or immediate reach (Engell, Kramer, Malafi, Salomon, & Lesh, 1996; Wansink, Painter, & Lee, 2006). By placing part of the meal in the to-go box, participants were not presented with the visual opportunity to consume the entire amount of food. In general, these participants were satisfied by the amount on their plate and were able to take home another meal of the same size because it been served out of sight in the to-go box.

The variation in total weight of spaghetti consumed (from 4.6-19.7 ounces) including all of the subjects in both the groups and these differences may be due to differences in age and gender. Further analysis of the data showed that there were a higher number of males in the control group than in the pre-meal to-go box group (14 and 3 respectively). This may have

skewed the results by control group participants consuming a larger amount of spaghetti than participants in the pre-meal to-go box group which may have created a false statistical difference.

The results of the Customer Satisfaction Survey indicate that in general, participants from both groups agreed that they were satisfied with: the portion size they received, their fullness after the meal, and the quality of their meal (Table 5). The low numerical averages (less than 3) for nearly all of these questions indicate that participants generally agreed with the statements on the surveys. Ratings for portion size, fullness at the meal, and perceived quality of the meal were similar between both groups. For example, 61.1% (n=11) strongly agreed and 22.2% (n=4) moderately agreed that they were satisfied with the portion size on their plate in the control group. Meanwhile, 42.1% (n=8) strongly agreed and 31.6% (n=6) moderately agreed that they were satisfied with the portion size on their plate in the pre-meal to-go box group. Again the higher ratings in the control group may be attributed to age and gender differences of participants between the two groups.

In a restaurant setting, selling a larger portion would be beneficial to the company, but providing pre-meal to-go boxes would be beneficial to the customer by getting more than one meal, and while not overeating to the same extent as being served the entire amount at one time.

Some of the poorer ratings of the overall quality of the meal (particularly question 3) could be due to preparing the spaghetti an hour before the meal was served and having limited ability to keep it warm while plating and weighing the dishes. Some of the comments in the Customer Satisfaction Survey comment section were: "meal could have been warmer", "pasta tasted 'pasty'", and "pasta could have been cooked better".

Study Limitations

A limitation of the present study was that the meal was provided free to participants. Customers at a restaurant may exhibit higher expectations for quality and serving sizes of purchased meals, because they expect to be served a larger portion size when eating out in a restaurant than when eating at home and when paying for their meal (Matthiessen, et al., 2003).

Another limitation of the study was the study sample size; with a larger sample size, a significant difference between the two groups in the Customer Satisfaction Survey may have emerged because the results were trending toward a slightly greater satisfaction with the control group. Furthermore, a larger sample size would decrease the possible bias present in the current study created by a greater number of young males being in the control group than the pre-meal to-go box group.

Recommendations for Future Studies

The present study could be improved by serving the two groups of participants in separate rooms so that there is no comparison between participants at different tables, which may have biased participants' intake in the present study. This would also enable the research to make a different survey for each group and decrease participant error in completing the survey questions regarding what type of to-go box they received. To further test the outcomes of this study, it could be implemented in a midscale, full-service restaurant to determine how paying customers respond to the use of pre-meal to-go boxes.

The sample population was another issue with this study that could have created more significance in the results than would naturally be present. Since a larger number of young males were present in the control group, (14 in the control group and 3 in the pre-meal group) the results of this group may have had a skewed high number of ounces consumed, and a very low number of ounces of leftovers following the meal. This bias could be decreased by using a larger sample size and randomly assigning individual's seating, not seating participants as parties, as many of the young men mentioned above came in one large party.

Future experiments may benefit by altering the methodology of the study by asking participants in the pre-meal to-go box group, when they are served their meal, how much they wish to set aside in the to-go box before they begin eating. This study design would more effectively measure individuals' willingness and motivation to decrease the amount of food that

they consume in a restaurant setting by purposefully setting aside part of their meal before they begin eating.

Implications & Applications

The results of the present study suggest that individuals can consume as half of a large portion size in a sitting and still experience satiety and satisfaction with their serving size, while still receiving value for price with a large amount of food. Additionally, restaurants will benefit from this strategy because it enables them to sell a larger serving of food, and thereby increase their profits per customer without creating a situation where most customers would overeat.

Conclusions

In addition to current strategies to decrease calorie intake during a meal by consuming foods with a lower energy density, or decreasing the portion sizes consumed over an extended period of time, using a pre-meal to-go box to help individuals determine their appropriate consumption amount may also be an effective weight loss strategy. Based on the findings of this study, portion sizes in a casual, midscale restaurant setting can be decreased to a more appropriate size and generally customers still be satisfied with the portion size and their fullness level at the end of the meal. The use of pre-meal to-go boxes in casual, midscale restaurant settings have the potential to decrease customer's consumption while still providing customers with value for price. The strong consensus among the pre-meal to-go box group that participants were satisfied with the portion they received and felt full after the meal, suggest that customers would be content with smaller portions in restaurant.

Although more research needs to be conducted in this area to determine effectiveness, based on the findings of this study, dietitians can recommend that consumers request to-go boxes and portion part of their meal out at the beginning of a restaurant meal to encourage lower intake in a single sitting. Furthermore, dietitians can also recommend that in any self-serve dining setting, consumers serve a smaller portion on their plate to consume fewer calories and still be satisfied.

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Appendix A

CONSENT TO PARTICIPATE IN RESEARCH

The Effect of Using Pre-Meal To-Go Boxes Prior to Starting Your Meal

You are invited to participate in a research study conducted by Margaret Schuster and Jim Painter PhD, RD, from the Department of Family and Consumer Sciences at Eastern Illinois University. Your participation in this study is entirely voluntary. Please ask questions about anything you do not understand, before deciding whether or not to participate.

PURPOSE OF THE STUDY

The purpose of this study is to assess how the eating environment affects food consumption.

PROCEDURES

If you volunteer to participate in this study, you will be asked to:

Eat your meal as you normally would. Investigators will assess the amount of food eaten at the end of the meal.
You will also be asked to fill out a satisfaction survey on the food quantity and overall meal quality following the end of the meal.

POTENTIAL RISKS AND DISCOMFORTS

There are minimal risks to participants in the study. Participants have the potential to be embarrassed by others viewing food consumption.

POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

From the research gathered, we will be able to analyze if altering the food environment has a positive influence on food consumption. With these findings, we may be able to ascertain positive changes that can improve the public's eating habits as well as weight maintenance and weight loss measures.

CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of numbered records of data and anonymous surveys. We will not collect any personal information. All research will be tracked by participant number. Research will be kept protected in Klehm Hall for three years in locked storage. After three years, the investigators will shred the research.

PARTICIPATION AND WITHDRAWAL

Participation in this research study is voluntary and not a requirement or a condition for being the recipient of benefits or services from Eastern Illinois University or any other organization sponsoring the research project. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind or loss of benefits or services to which you are otherwise entitled.
There is no penalty if you withdraw from the study and you will not lose any benefits to which you are otherwise entitled.

Pre-Meal To-Go Boxes: Implications for Portion Control

IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about this research, please contact:

Jim Painter, Phd, RD
(217)549-3275
Jimpainterphd@gmail.com

Margaret Schuster
(440) 212-4915
mjschuster@eiu.edu

RIGHTS OF RESEARCH SUBJECTS

If you have any questions or concerns about the treatment of human participants in this study, you may call or write:

Institutional Review Board
Eastern Illinois University
600 Lincoln Ave.
Charleston, IL 61920
Telephone: (217) 581-8576
E-mail: eiuirb@www.eiu.edu

You will be given the opportunity to discuss any questions about your rights as a research subject with a member of the IRB. The IRB is an independent committee composed of members of the University community, as well as lay members of the community not connected with EIU. The IRB has reviewed and approved this study.

I voluntarily agree to participate in this study. I understand that I am free to withdraw my consent and discontinue my participation at any time. I have been given a copy of this form.

_____
Printed Name of Participant

_____ _____
Signature of Participant Date

I, the undersigned, have defined and fully explained the investigation to the above subject.

_____ _____
Signature of Investigator Date

Appendix B

Leftovers Research Study: Customer Satisfaction Survey

Please answer the following questions as honestly as you can. Your answers will be kept anonymous.

Gender (Circle your answer): Male / Female **Age:** _____

Use this scale to rate the extent that you agree with the following statements:

1	2	3	4	5	6	7
Strongly Agree	Moderately Agree	Slightly Agree	Neutral	Slightly Disagree	Moderately Disagree	Strongly Disagree

1. **If you were offered a to-go box at the end of the meal: I was satisfied with the portion size of the food on my plate. (Circle your answer)**

1 2 3 4 5 6 7

1pre. **If you were given a to-go box at the start of the meal: I was satisfied with the portion size of food on my plate. (Circle your answer)**

i. 2 3 4 5 6 7

2. **I felt full at the end of the meal. (Circle your answer)**

i. 2 3 4 5 6 7

3. **Overall, the quality of this meal was excellent. (Circle your answer)**

i. 2 3 4 5 6 7

Your responses are greatly appreciated!

Appendix C

Email correspondence: Email Invitation

Hello All,

You are invited to attend a FREE spaghetti dinner Tuesday, April 22nd in lieu of the usual Pantera dinner. This meal is part of my graduate thesis and your participation would be greatly appreciated. Seating will begin at 5:30 to 6.

The menu will be: breadsticks, Caesar salad, spaghetti, spaghetti sauce or spaghetti sauce with meat, and ice cream for dessert.

Please email mjschuster@eiu.edu to RSVP.

Thanks! Maggie Schuster

Reservation Confirmation Email:

Hello!

Thanks for your interest in my research. I have made reservations for __ people for you. Please notify me if your plans change.

I look forward to seeing you at your seating time at 5:45 on Tuesday April 22.

Sincerely, Maggie Schuster

Reminder email sent to participants who RSVPed:

Hello All,

Just a reminder for the spaghetti dinner on Tuesday, April 22. Please come at your seating time listed in a previous email.

Please notify me if you will not be able to attend. We look forward to seeing you on Tuesday.

Thanks, Maggie Schuster

Appendix D

Spaghetti Data Collection Sheet

Plate #	Initial weight of plate spaghetti	Weight of the plate after the meal	Wt. of the to-box Pre Meal	Wt. of the to-box Post Meal
1				
2				
3				
4				
5				
6				
7				
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